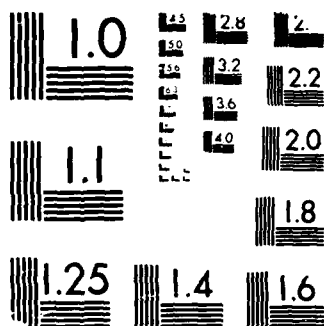


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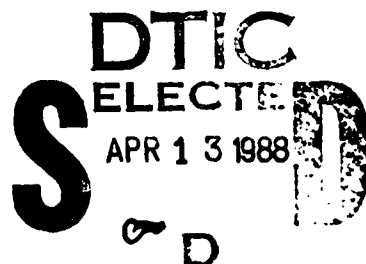




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Charge Storage and Switching Phenomena in Metal Complexes

Final Report

H. K. Le Armond, K. W. Hanck, and D. W. Wertz

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| FIELD | GROUP | SUB-GROUP | |
| | | -Polymer pendant, switching phenomena, ESR, electro-chemically generated, multiple emitters, photoselection | |
| 19. ABSTRACT (Continue on reverse if necessary and identify by block number) The purpose of this research is to identify intramolecular charge separation and charge localization phenomena that can when incorporated into polymer materials provide the basis for molecular switching phenomena. The first year and a half of this work has been spent designing monomer molecules possessing unusual photophysical properties and determining the physical measurement technique to be exploited with the polymers. A unique multiple emitting Ru(II) compound containing the 2,2'-dipyridylamine ligand has been identified and the photophysical properties measured. The validity of the emission photoselection technique as a primary method of characterizing excited state charge localization in Ru(II)L ₃ ²⁺ (L = electron diimine ligand) has been verified to correct the incorrect data and interpretation of others. A detailed experimental study of the photoselection properties of RuL ₃ ²⁺ , RuL ₂ L ²⁺ , and RuL ₂ X ₂ ²⁺ (L and L' are bidentate Π diimine ligands and X is a monodentate ligand) complexes as a function of solvent has provided the basis for a model that recognizes the role of spin-lattice relaxation in the emitting manifold and attributes variation | | | |
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as a function of structure in the maximum excitation P_{\max} to interchromophoric coupling between the Π ligand systems. This study and previous efforts make apparent that the charge localization is intrinsic in nature, not solvent driven. Examination of cyano bridged dimers, and trimers of Ru-bpy indicates that the photophysical properties are altered substantially relative to the monomer properties in solution.

Within the past few months, the emphases has shifted to the polymer pendant $[\text{Ru}(\text{bpy})_3]^{2+}$ materials. The excited state properties of the pendant complex attached to polyvinylbipyridine and polystyrene polymer have been examined and absorption, emission and polarization spectra appear little perturbed by the polymer environment. In contrast, the electrochemically generated species show unique changes in the ESR of the polymer pendant material vs. the free monomer species. The future emphasis will include attachment of various mixed ligand complexes to the polymer as well as use of different polymer backbones. Professor DeArmond will continue the research program after his move to New Mexico State University.

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